

THREE NEW SPECIES OF CARALLUMA FROM SOUTH-WESTERN ARABIA

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(With Plates XI-XIV.)

1. *Caralluma deflersiana* Lavranos nov. sp., affinis *C. sacculatae* N.E.Br. sed lobis corollae tubo longioribus, apicibus loborum coronae interioris non erectis differt.

Caules erecti vel ascententes quadranguli, 5—7 cm. longi, 12—15 mm. crassi, dentibus patulis, 8—12 mm. longis, glaucovirides, brunnei maculati; flores solitarii, ex parte apicale caulium juvenium producti; bracteae deltoideae, acutae, 2 mm. longae; pedicelli teretes, glabri, glauco-virides, erecti, 10 mm. longi, 3 mm. diam.; sepala deltoidea, acuta, glauco-viridia, 7 mm. longa, basi 2 mm. lata, apice leviter reflexa; corolla campanulata, extus glauco-virens, brunnea maculata; tubus cylindricus, basi rotundatus, 13 mm. longus, 10 mm. latus, intus basi puniceus, glabrus, deinde fusco purpureus dense sed minute tuberculosus; lobi ovati lanceolati, 18 mm. longi, basi 9 mm. lati, oblique ascendentes, marginibus leviter revolutis, intus fuscopurpurei, confertim sed minute puberuli; columna staminalis 8 mm. alta; corona exterior 8 mm. diametro, cyathiformis, lobis 5, sacciformibus, basi rotundatis instructa, intus extusque punicea, marginibus loborum integris, fuscopurpureis; coronae interioris lobi 4 mm. longi, 0.75 mm. lati, lineares, fuscopurpurei, apice rotundati ed emarginati, oblique adscendentes, antheras arcte incumbentes, summo apice conniventes.

TYPE LOCALITY: South Western Arabia, South Arabian Federation, Audhali country, 1 mile West of Lodar, alt. appr. 3,300 feet (1,000 metres), lat. 13° 52' 30"— N., long. 45° 51' 30"— E., coll. in flower 16 August, 1962, fl. Pretoria, 7 April 1963 (Lavranos 1788; KEW, holotype; PRE, isotype).

Stems densely tufted, ascending-erect, 4-angled, 5—7 cm. long, 12—15 mm. thick excluding the stout, horizontally spreading, acute, 8—12 mm. long teeth, grey-green with numerous, oblong, brownish spots.

Flowers solitary from near the apices of young stems.

Bracts deltoid, acute, 2 mm. long.

Pedicel terete, glabrous, erect, grey-green, 10 mm. long, 3 mm. thick.

Sepals deltoid, acute, glabrous, grey-green, 7 mm. long, 2 mm. broad at base, the apices slightly reflexed.

Corolla campanulate, outside grey-green with numerous brownish spots *tube* cylindric, not constricted towards the mouth, rounded at the very base,

13 mm. long, 10 mm. diam., inside pink and glabrous at base, thereafter dark purple-brown, densely but minutely tuberculate; lobes ovate-lanceolate 18 mm. long, 9 mm. broad at base, obliquely ascending, the margins somewhat revolute, inside dark purple-brown densely covered with minute bristle-like papillae.

Staminal column 8 mm. high.

Outer corona 8 mm. in diameter, 5-lobed, consisting of 5 intergrown concave pouches, opening laterally so that the sinuses between the lobes are situated higher than the apices, pink within and without, the margins of the lobes dark purple-brown, rounded, entire.

Inner corona lobes 4 mm. long, 0.75 mm. wide, linear, dark purple-brown, with rounded and somewhat emarginate apex, adnate to the outer corona at the raised sinuses between the lobes, obliquely ascending, somewhat incurved incumbent upon the anthers, connivent at their very apices.

C. deflersiana is closely allied to *C. sacculata* N.E. Br. from Southern Ethiopia, with which it shares the long-tubed corolla and the interesting outer corona which in both species is divided into five pouches. Our species, however, differs from its ally in that the corolla lobes are longer than the tube while in *C. sacculata* the reverse is the case. Moreover, in *C. deflersiana* the inner corona lobes are ascending and incurved, their apices just touching 1 mm. or so above the anthers, while in the older species the apices are erect.

Another closely related species is *C. tubiformis* Bruce et Bally from Northern Kenya. In this species, however, the lobes and upper portion of the tube are covered with long, white hairs, while the inner corona lobes are horizontally inflexed over the anthers.

It is felt that this plant differs sufficiently from its allies to be awarded specific rank. It is named in honor of Alfred Deflers, the great and intrepid French botanist, who travelled extensively in South Western Arabia towards the end of the 19th century. To him we owe almost all that is known of the botany of what is now the South Arabian Federation.

A beautiful species, *C. deflersiana* is conspicuous for the large size of its very dark flowers. The dome-shaped coronal structure is of particular interest. The pink outer corona is remarkable for the fact that the pouch-like dark purple-brown lobes are open laterally, while the sinuses between them are pointing upward and support the long, dark inner corona-lobes. This unusual corona is very beautiful.

Our species was collected on the 16 August 1962, 1 mile West of Lodar in the Audhali country of the Federation of Southern Arabia in a sandy plain. It was found growing in the shade of a fair-sized tree of *Acacia tortilis* (Forsk.) Hayne, near the fence surrounding the grounds of the Agricultural Research Station, in association with *Caralluma penicillata* (Defl.) N.E. Br., *Euphorbia cf. inarticulata* Schweinf., *Sansevieria ehrenbergii* Schweinf., *Cissus quadrangu-*

laris L. and *C. rotundifolia* (Forsk.) Vahl. The plants were in flower and specimens were preserved in liquid.

The species was also found on the plain five miles South of Lodar (Lavranos 1897 and 1904) where it is very common. It grows here in association with the same species as well as *Adenia venenata* Forsk., *Huernia* sp. (Lavranos 1900) *Duvalia sulcata* N.E. Br., *Jatropha lobata* (Forsk.) Muell., *Dipcadi tacazeaeum* (Hochst.) Bak., *Maerua* sp. and *Zygophyllum simplex* L.

C. deflersiana belongs to the *Ango* group of the genus.

2. ***Caralluma hexagona*** Lavranos, nov. sp. affinis *C. umbellatae* Haworth sed caulibus hexagonis, fasciculis florum sub-terminalibus, corollae textura, pilis ad apices loborum corollae fasciculatis discedit; affinisque *C. edithae* N.E. Br. sed caulibus brevibus, hexagonis, floribus majoribus, flavis, rubro-purpureis maculatis differens.

Caules conferti, ascendentes, glabri, virides vel glauco-virides, hexagoni vel rarius 5- vel 4-goni, angulis compressis, sinuato-dentatis, 3—5 cm. (tenus 8 cm.) longi, 15—20 mm. crassi; folia deltoidea, parva, viridia, mox decidua; flores 5—9 in fasciculis sub-apicalibus producti; pedunculi breves, cuspidati; bractae lineares, minimae; pedicelli teretes, glabri, virides, ca. 10 mm. longi, 1·5 mm. diam.; sepala deltoidea, acuta, carinata, viridia, minute rubro-punctata, 2—3 mm. longa, basi 1 mm. lata; corolla rotata, tenus 22 mm. diam. inter apices loborum, extus albo-virens, maculis rubris, convexis, parvis punctata, intus flavescens, anguste rubro-purpurea marginata, ubique maculis rubro-purpureis, convexis, vernicosis dense induta, glabra; loborum apices pilis vibratilibus simplicibus, compressis, fuscis rubro-purpureis, 2 mm. longis, fasciculatis, induti; tubus brevis, 3 mm. longus, 6 mm. diam.; lobi deltoidei. acuti, tenus 8 mm. longi, basi tenus 8 mm. lati; corona exterior concava, fusca rubro-purpurea, tenus 6 mm. diam., lobis profunde bifidis, segmentis horizontaliter curvatis divergentibus, canaliculatis, puniceis marginatis; coronae interioris lobi breves, minusque 1 mm. longi, non conniventes, supra antheras horizontaliter incumbentes, lineares, punicei, apice truncato-emarginato, flavo.

TYPE LOCALITY. South Western Arabia, South Arabian Federation, Audhali Plateau, 3 miles South of Al Madhan, on bare, rocky diabase hill, alt. appr. 7,500 ft. (2,250 metres), lat. 13° 58' N., long. 45° 40' E., collected in flower on 17 August 1962, fl. Johannesburg 10 January 1963, and Pretoria 26 February 1963 (Lavranos 1829: KEW, holotype; PRE, isotype).

Plant suckering in all directions and forming dense mats.

Stems ascending, 3—5 cm. (up to 8 cm.) long, 15—20 mm. thick, green or greyish-green, glabrous, six-angled or rarely 4- or 5-angled, angles compressed, sinuous-dentate.

Leaves small, deltoid, soon deciduous.

Flowers 5—9 mm., in fascicles just below the apex of young stems.

Peduncle cuspidate, short.

Bracts linear, short.

Pedice terete, glabrous, green, appr. 10 mm. long, 1·5 mm. diam.

Sepals deltoid, acute, carinate, green with many minute red spots, 2—3 mm. long, 1 mm. broad at base.

Corolla rotate, up to 22 mm. diam. between apices of lobes; *outer surface* greenish-white with many small, red, wart-like spots but more so on the lobes; *inner surface* cream with a greenish tinge and a narrow, dark purple-red margin, densely covered throughout with dark purple-red, round, convex, verrucose spots, glabrous, except for a tuft of dark purple-red, simple, compressed, vibratile hairs, up to 2 mm. long at the apex of each lobe; *tube* short, appr. 3 mm. long, 6 mm. diam.; *lobes* deltoid, acute up to 8 mm. broad at base and as long.

Outer corona concave, dark purple-red, up to 6 mm. diam., the lobes deeply bifid, with horizontally diverging, canaliculate, curved segments which have a pink margin.

Inner corona lobes short, less than 1 mm. long, closely and horizontally incumbent upon the anthers, linear, pink with truncate-emarginate yellowish apices.

The closer affinities of this species are indeed rather difficult to determine. While it clearly belongs to the *Europaea-Umbellata* group, its six-angled stems serve to distinguish it from all other known species of that group. This character is, in itself, very unusual within the genus.

The flowers, as a composite entity, differ widely from those of all other known species.

The corolla, in shape and texture, closely resembles that of certain *Stapeliae* from Southern Africa and in particular the non-ciliate form of *Stapelia parvipuncta* N.E. Br., while the tufts of vibratile hairs borne at the apices of the corolla lobes are a character which our species shares with *C. edithae* N.E. Br., and *C. penicillata* (Defl.) N.E. Br., but the latter has a totally different corona.

The corona of *C. hexagona* has broadly the same general structure as the coronae of various species in the *Europaea-Umbellata* group with which it shares the deeply bifid outer corona lobes, but in our species these lobes are horizontally spreading, which is a character reminiscent of some species of *Trichocaulon*.

So far as I can judge, *C. hexagona* is most closely related to certain Indian species of the genus and in particular to some forms *C. umbellata* Haw. from Peninsular India but while it shares with these the form of the outer corona, it differs very much in habit, form of stems and in the texture of its corolla from this and all other known Asiatic species. Another related species is



PLATE XI.

Caralluma deffersiana Lavranos. The type plant, actual size. Photograph: Division of Botany, Pretoria.



PLATE XII.

Caralluma deflersiana Lavranos x2.
Photograph: Division of Botany, Pretoria.



PLATE XIII.

Caralluma solenophora Lavranos. A fascicle of flowers, x2.
Photograph: Division of Botany, Pretoria.



PLATE XIV—FIG. 1.
Caralluma hexagona Lavronas, $\times 0.80$.
 Photograph: Division of Botany, Pretoria.

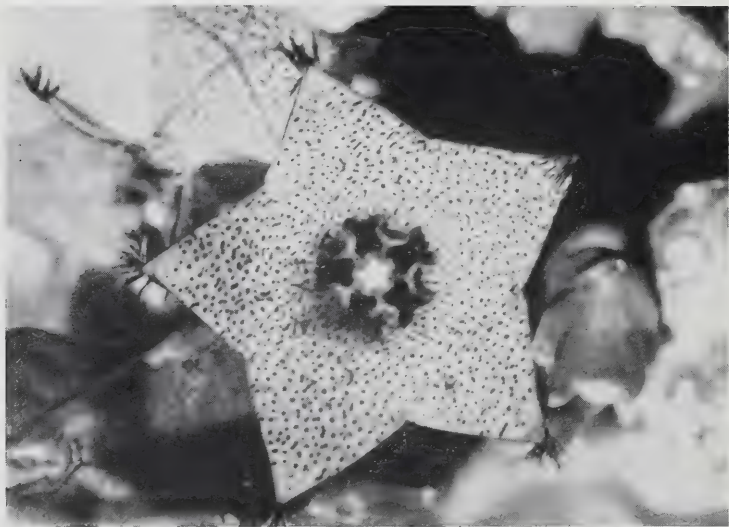


PLATE XIV—FIG. 2.
Caralluma hexagona Lavranos. A single flower, $\times 3\frac{1}{2}$.

C. edithae N.E. Br. from Northern Somalia which, however, is a large, shrubby plant with much smaller, uniformly dark-purple flowers, while the bifid outer corona lobes are erect. Our species differs, moreover, from all those above referred to by the fact that its umbels contain a much smaller number of flowers and are sub-terminal.

This unusual species was found on the Audhali Plateau (Kor al Audhilla) in the Federation of Southern Arabia, 3 or 4 miles South of the border of the Yemen on a bare, rocky hill consisting of diabase and metamorphic rocks, only a short distance from the village of Al Madhan. It appears to be rare and, despite a diligent search, only two plants were discovered.

Our plants were growing in association with *Caralluma quadrangula* (Forsk.) N.E. Br., *C. plicatiloba* Lavranos, *Senecio pendulus* (Forsk.) Sch. Bip., *S. antephorbium* (L.) Sch. Bip. var. *odorus* (Forsk.) Rowley, *Lantana subtracta* Hiern., *Barbacenia arabica* (Bak.) O. Schwartz, *Craterostigma plantagineum* Hochst. and a few other plants. They were in flower when collected and specimens were preserved in liquid.

Live plants sent to Johannesburg and the Division of Botany, Pretoria, flowered there on 10 January and 26 February 1963 respectively, when the present description was made possible.

3. *Caralluma solenophora* Lavranos, nov. sp. affinis *C. diffusae* (Wight) N.E. Br. sed habitu, marginibus loborum nusquam ciliatis tubo corollae longissimo, structura coronae, umbellis floralibus paucifloris differt; affinisque *C. penicillatae* (Defl.) N.E. Br., sed habitu, magnitudine florum, corolla tubata, structura coronae discedit.

Planta multiramosa, usque ad 20 cm. alta; Caules erecti vel adscendentes, ramosi, ramis minusque 8 cm. longis, 20 mm. crassis, tetragonis, glabris, viridibus, angulis compressis, dentibus obtusis, apice retrospicientibus; folia parva, deltoidea, mox decidua; flores 4—6, in fasciculis sub-apicalibus producti; pedunculi usque ad 5 mm. longi; bracteae lineares, acutae, 1—2 mm. longae; pedicelli teretes, glabri, ca. 6 mm. longi, 1.5 mm. diam.; sepala lanceolata, acuta, viridia, 4—5 mm. longa, basi 1 mm. lata; corolla longissime tubiformis, ca. 22 mm. longa, extus glabra, brunneo-flavescens, obscure in longitudinem lineata vel sulcata, intus basi tubi flavescens, fusco-purpurea punctata, deinde flava, confertim fusco-purpurea lineata, glabra, fusco purpurea marginata; tubus ca. 19 mm. longus, basi globosus, 9 mm. diam., superne a 6 mm. constrictus, deinde iterum per longitudinem 11 mm. 8 mm. latus, strictus; lobi patuli leviter deflexi, deltoidei, acuti, basi 7 mm. lati, 5—6 mm. longi, ad apices pilis fusco-purpureis, vibratilibus, simplicibus, complanatis, 1—2 mm. longis, fasciculatis induti; corona exterior cyathiformis, obtuse pentagona, ca. 5 mm.

diam. 4 mm. alta, extus verticaliter sulcata, margine sub-integro, fusco-purpurea; coronae interioris lobi, fusco-purpurei, ascendentes et supra antheras arcte incumbentes, 2 mm. longi et lati, basi lata in longitudinem bisulcati, marginibus parte media tangentibus, apice sub-quadrati, emarginati.

TYPE LOCALITY. South Western Arabia, South Arabian Federation, Audhali Plateau, South of Mukeiras, on upper rocky western slope of Wadi Salul, lat. $13^{\circ} 55' N.$, long. $45^{\circ} 40' E.$, alt. appr. 7,000 feet (2,100 metres); coll. in flower 18 Aug. 1962, fl. Pretoria 24 Jan. 1963 (Lavranos 1860: KEW, holotype; PRE, isotype).

Plant densely branched, up to 20 cm. high.

Stems erect or ascending, branched, the branches less than 8 cm. long, 20 mm. diam., 4-angled, glabrous, green or brownish-green, the angles compressed, the teeth rather obtuse with downward pointing apices.

Leaves small, deltoid, soon deciduous.

Peduncles raised, up to 5 mm. long.

Bracts linear, acute, 1—2 mm. long.

Pedice terete, glabrous, appr. 6 mm. long, 1.5 mm. diam.

Sepals lanceolate, acute, green, 4—5 mm. long, 1 mm. broad at base.

Corolla very long tubiform, appr. 22 mm. long, outside glabrous, yellowish-brown, obscurely longitudinally lineate or sulcate, inside narrowly margined with dark purple-brown, creamy-yellow with dark purple-brown spots at base of tube, thereafter yellow, densely covered with narrow, irregular, transverse, dark purple bands, which become confluent towards the apices of the lobes, glabrous; *tube* appr. 19 mm. long, globose and 9 mm. diam. at base, becoming constricted to a diameter of appr. 6 mm., thereafter widening again abruptly to 8 mm. and remaining straight (cylindrical) for a length of 11 mm.; *lobes* spreading horizontally, somewhat reflexed, deltoid, acute, 7 mm. broad at base, 5—6 mm. long, glabrous, bearing at their apices a fascicle of dark purple, laterally compressed, simple, vibratile hairs, 1—2 mm. long.

Outer corona cupular, obtusely pentagonal with rounded angles, appr. 5 mm. diam., 3.5 mm. high, outside vertically furrowed, dark purple with a sub-entire margin.

Inner corona lobes dark purple, ascending and closely incumbent upon the anthers with two longitudinal furrows in their lower half and one down the middle of the apical portion, touching each other laterally in their middle section, appr. 2 mm. broad at base, 2 mm. long, narrowing abruptly at about half their length to appr. 1 mm. and terminated in sub-quadrata, emarginate apices.

C. solenophora, one of the most remarkable species in the Arabian section of the genus, belongs to the *Europaea-Umbellata* group, on account of the fact that it produces its flowers in sub-terminal umbels. Its affinities are other-

wise rather distant. They seem, broadly speaking, to point in the direction of certain species from India. Of these, *C. diffusa* (Wight) N.E. Br. appears to be closest to our species but differs from it by its much shorter, campanulate corolla-tube, in having ciliate corolla-lobes, in lacking the terminal tufts of vibratile hairs, in producing its many-flowered inflorescences at the very apices of the stems, and in having a rather different corona.

C. penicillata (Defl.) N.E. Br., from Southern Arabia and the Red Sea hills of Eritrea and the Sudan is another relative but has much smaller, rotate flowers produced in dense, lateral umbels and is, otherwise, a very large plant with sparsely branched stems reaching a height of 4 feet or even more. The structure of its corona is closer, however, to that of *C. solenophora* than that of any other known *Caralluma*.

It is interesting to note that, in *C. solenophora*, the inner corona lobes, which are adnate to the outer corona cup just below its rim, are in contact with each other laterally in their middle section just above the pollen masses while, between their bases, there is an opening by which access may be gained to the style.

C. solenophora is an altogether remarkable species both in the form of its flowers and in the structure of its corona. It was collected on the upper western slope of Wadi Salul, on the Audhali Plateau a few miles South of the village of Mukeiras near the edge of the escarpment, on 18 August 1962, by Major M. D. van Lessen, who accompanied Mr. Meintjes and me on several occasions while we were in that area.

The species was found growing on very rocky ground in association with *Euphorbia balsamifera* Ait. (syn. *E. adenensis* Defl.), *E. schimperi* Presl., *Aloe* sp. (Lavranos 1817), *Huernia marnieriana* Lavranos, *Echidnopsis* sp. (Lavranos 1848), *Dorstenia foetida* (Forsk.) Schweinf., *Adenium obesum* (Forsk.) R. et S., *Coleus barbatus* (Andr.) Benth., *Cotyledon barbeyi*, Schweinf., *Barleria* spp., *Acacia* spp. and various other plants. The plant found by Major van Lessen was in flower and a specimen was preserved in liquid.

C. solenophora seems to be a rather rare species in its habitat and we observed only three plants, although we spent several hours collecting in the area where it was first seen.

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